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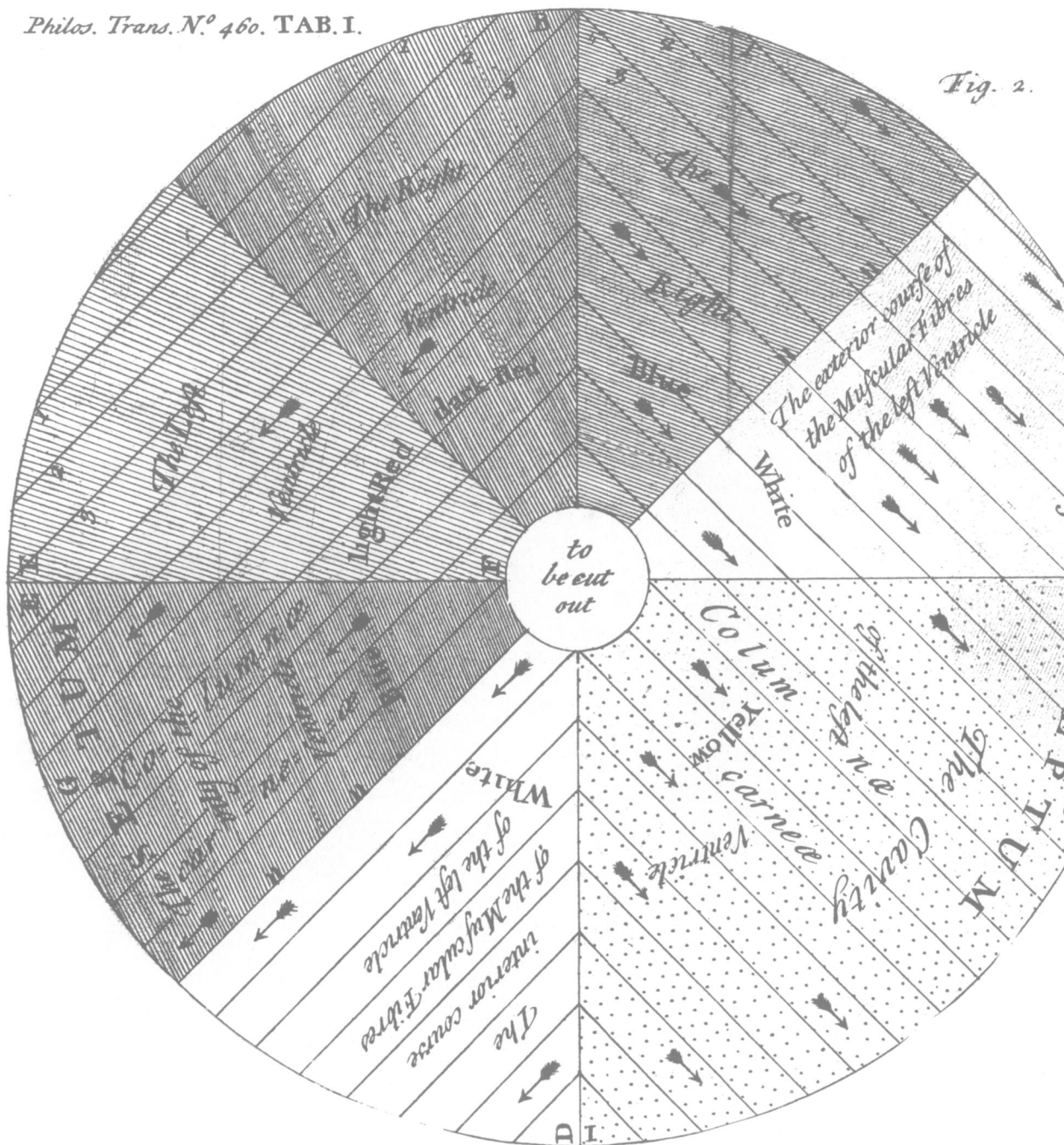
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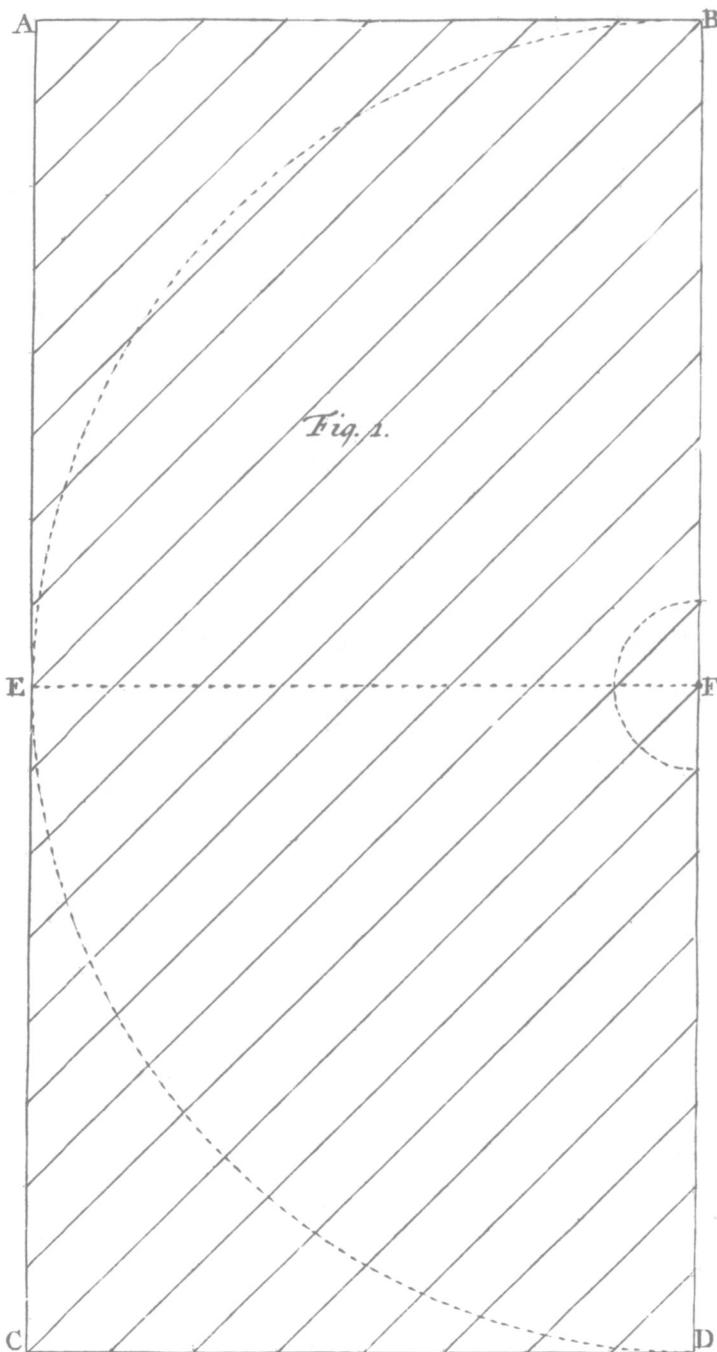
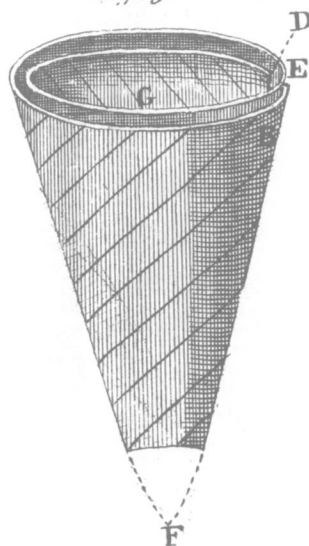
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Fig. 2.







*Fig. 1.*

*Fig. 4.*



Here it may be cut of



IV. *A Letter from Cromwell Mortimer, M.D. Fellow of the Royal College of Physicians London, Secretary to the ROYAL SOCIETY of London, Member of the Gentlemens Society at Spalding, &c. to William Bogdani, Esq; F.R.S. and Member of the said Society at Spalding, &c. containing a short Account of Dr. Alexander Stuart's Paper concerning the Muscular Structure of the HEART: Which was read at several Meetings of the ROYAL SOCIETY in May and June 1735. drawn up at the Request of several Gentlemen of the Spalding Society. Now published with some Additions.*

*Dear SIR,*

I Was out of Town when your Letter of the 23<sup>d</sup> past came to my House, whereby you inform me, it would be highly agreeable to our Fraternity at *Spalding*, if I would oblige them with a short Account of Dr. *Stuart's* most curious Papers on the Heart, lately laid before the ROYAL SOCIETY: I did not come to Town till some Days after, and then I waited for an Opportunity of seeing Dr. *Stuart*, and asking his Leave to send you an Account of the Papers, as desired, which I ought not to do without it: These are the Reasons of my not having wrote sooner. I desire you to make my Compliments to  
the

the Society, and beg their Acceptance of this rough Sketch of the Doctor's most curious Discoveries, which I have drawn by Memory, not having any of the Doctor's Papers by me, except some Drawings, of which I herewith send you Copies, [and are engraved, with some Improvements, in the Tables annexed; see TAB. I. Fig. 1, 2, 3, 4.]

I shall not here undertake to give a Description of all the Parts belonging to the Heart, supposing them already sufficiently known from the anatomical Writers; but shall only explain the surprising Simplicity of the *Muscular Structure* of the HEART, as the ingenious Dr. *Stuart* hath demonstrated it from various Preparations of boiled Hearts; viz. that *the Heart is nothing else than a single Muscle of nearly a semicircular Form, whose Fibres are all parallel*: For, suppose a rectangular Parallelogram  $ABCD$ , (see TAB. I. Fig. 1.) consisting of Two Squares  $ABEF$ , and  $EFC'D$ ; in each of which draw first the Diagonals  $EB$  and  $CF$ ; then fill the whole Parallelogram, or both Squares, with Lines at equal Distances, and parallel to the Diagonals: This done, at the Centre  $F$ , with the *Radius*  $FB$ , draw the Semicircle  $BED$ . [and do the same on the Back-side of the Paper; so that every Line on the Back-side may lie exactly under each corresponding Line on the Fore-side, and that each Side may be as exactly alike, as if the Paper were transparent, and that the Lines might be seen equally plain on either Side:] Cut this Semicircle out of the Parallelogram, and cut out likewise a small semicircular Piece at the Centre  $F$ ; then roll up this semicircular Piece of Paper in a conical manner, so that the Back-side of  $D$  [or to  $I$ , in Fig. 2.] be folded

to the Back of *E* [or to *H* in Fig. 2.] and this Fold turned round, till *E* comes to the Back-side of *B*. as in Fig. 3. and the Seam formed by the Edges *BF* and *EF* may be pasted together, only the inner Fold on the Right Side must be pushed back from the outer circular one, so as to form a Partition, as at *G*. in Fig. 4. and 3. by which means Two Cavities will be formed, that on the Right Side the Partition in this Form , the other, on the Left Side, almost circular, thus, , as in Fig. 4. the Outside of the first consisting but of one single Fold, the Outside of the latter consisting of a double Fold, and the Partition being but of one Fold: Thus the first Cavity represents the Right Ventricle of the Heart, the other the Left Ventricle, and the Partition *G* the *Septum*, as in Fig. 4. [All these Particulars are distinctly expressed in Fig. 2. which is to be cut off from Fig. 1. 3. and 4. and is to be folded upon the Line *BD*, so that the Letters *EE* and *HH* come exactly Back to Back, and that the Line *EF* and *HF* tally precisely; paste this Paper thus folded together Back to Back, then cut off the white Paper to the Rim of the Circle, and cut out a Piece at the Centre to *F*, and you will by this means have a semicircular Piece of Paper, with all the Lines represented on both Sides tallying to each other, as above described at Fig. 1. But as it was very difficult to print on each Side of the same Paper, so as to make the Lines tally, I thought it better to have this Figure printed in a whole Circle, that so such, as would be at the Pains, might cut it off, paste it, and fold it, and thus, as it were, form a Model of an Heart. In this Figure likewise I ordered the Engraver to distinguish the several Surfaces of the muscular Coats, by Lines and Dots, in such man-

ner as Colours are represented in Heraldry-graving : Thus the Outside of the Right Ventricle is shaded with Lines running from Top to Bottom pretty close, which denote that you should paint that of a dark Red; the Outside of the Left Ventricle, with Lines in the same Direction, but farther asunder, to denote a lighter Red ; the Inside of the Right Ventricle is shaded with Lines from Right to Left, to denote it should be coloured (for Distinction-sake) blue ; then, where the double Course of Fibres form the outward Side, or Left Side of the Left Ventricle, and which are not to be separated but by Art, there the Paper is left white or blank ; but the Inside of the Cavity of the Left Ventricle is dotted, to represent yellow, that it may be coloured so : The colouring the Figure in this manner, makes all the Parts much more distinct, when rolled up into a Cone.]

This Model, if I may so call it, compared with the Heart of Man or Quadruped, will be found to answer in the following Manner : The Edge *BF*, in Fig. 1. or *EF*, in Fig. 2. answers to the tendinous Seam or *Sulcus*, which runs along the superiour Side of the Heart ; and the Direction of the parallel Lines in Fig. 1. and 2. answers to the Course of the Fibres in each Part of the Heart ; the circular Edge of the Paper *BED* answering to the tendinous Circle round the Base of the Heart, from which, and the Seam *BF*, all the muscular Fibres take their Original : The exterior Fibres of the Right Ventricle, next the *Apex* or Point of the Heart at *F*, decussate \* each

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\* This may be imitated by gumming on Threads, in the same Directions as the parallel Lines in Fig. 1. turning them back cross the Hole left at *F*.



other, run inwards, and then, rising up again towards the Base, form that Side of the *Septum* which constitutes Part of the Inside of the Right Ventricle; and likewise form the *Columnæ carneæ* of the Right Ventricle: The Fibres of the interior Course of the Left Ventricle decussate and form in the same manner the internal Fibres and *Columnæ carneæ* of the same Ventricle: The external Course of Fibres of the Left Ventricle are only a Continuation of those of the Right Ventricle, which together embrace the Heart circularly, while the internal Course of Fibres of the Left Ventricle run chiefly from the *Apex* towards the Base, so that on the Left Side of the Ventricle they cross the external Course nearly at Right Angles; but on the Side of that Ventricle which forms the *Septum*, they run from the *Apex* towards the Base, in the same Direction as on that Side of the *Septum* which is next to the Right Ventricle.

The several Courses of the Fibres may be easily traced in a boiled Heart; and if they are not found to answer to the Directions of the Lines on the Paper-cone with the strictest mathematical Exactness, when rolled up as at Fig. 3. you must consider, that the Form of the Heart is not exactly conic, though nearest reducible to that Figure; and moreover that the Base is not a Plane as in the Paper-cone, but of a convex round Form; and the tendinous Circle round it is of a smaller Diameter than the Middle Part of the Heart.

By this Structure and Circumvolution of the Fibres, the Muscle which constitutes the Heart, doth, by a simple Contraction of its Length, by those external Fibres, which encompass both Ventricles, contract the Diameter of the Heart, while by the internal

Fibres, that form the *Septum* and Inside of the Left Ventricle, it shortens the Length of the Heart, or draws the *Apex* up nearer to the Base: This is done without any Contrariety in the Action of these Fibres, or destroying the Force of each other; but, on the contrary, they being all parallel to each other, and a Continuation of the same Fibres, do assist each other in their Action.

The Doctor supposes this Contraction is not caused so much by the Influx of the nervous Spirits, as by the Influx of the arterial Blood, through the Coronary Arteries into the Substance of the Heart; and that the Contraction of the Auricles comes from the same Cause; which will be alternate with that of the Heart, because the lateral Branches, which arise out of the Trunk of the Coronary Artery, that encompasses the Base of the Heart and both Auricles, are on one Side distributed into the Substance of the Heart, and on the other Side into the Coat of the Auricles; and will be alternately compressed, and alternately free, as the Auricles and Ventricles are alternately full or empty of Blood.

I hope you will excuse the Imperfections of this short Account; and that our Brethren will accept it as a Mark of my Respect, and that it may satisfy their Curiosity for the present, till the Doctor's Account at large shall be published. I am,

London, Aug. 7.

1735.  
To W<sup>m</sup>. Bogdani, Esq;  
Etc. [then] at Spil-  
cing.

S I R,

Your most obliged,  
Humble Servant,

C. Mortimer.